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ABSTRACT

This paper is linked to the theme History and Philosophy of Science. The Evolution and creation science controversy is now in the general public's arena and poses a challenge for school science. The paper begins by briefly describing the current situation concerning this issue in Australia and the United States of America. In the subject Biology, debating controversial issues is a popular strategy with teachers. However, Rodger Bybee questions this approach. He contends that when teaching about evolution teachers should educate students about the nature of science and develop their science inquiry abilities, rather than debating the issue. This paper supports this view, based on the argument that the creationism and evolution dispute is not really about Biology or faith, but is about Biblical interpretation. A summary of the major differences between Theistic Evolution and Creationism is described. Teaching about Charles Darwin in the historical context of the 19th century is suggested as one way to assist students to develop an understanding of science as being socially constructed. Henri Bergson argued that the process of natural selection could not adequately explain the evolution of complex organs such as the vertebrate eye. He believed that there is another channeling force at work called the "vital impulse." In Bergson's Creative Evolution he argues for lived time--the uniqueness of time in the lived experience--which is duration, not the mechanistic clock time. Accordingly, the view of science currently being taught in schools is challenged. The dilemma is that while a mechanistic view of science continues to dominate Western thinking, the science taught in classrooms will be inadequate. (Contains 16 references.) (Author/YDS)

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THE EVOLUTION/CREATION SCIENCE CONTROVERSY: EDUCATE RATHER THAN DEBATE

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Abstract

This paper is linked to the theme History and Philosophy of Science. The evolution and creation science controversy is now in the general public's arena and poses a challenge for school science. I begin the paper by briefly describing the current situation concerning this issue in Australia and the United States of America. In the subject Biology, debating controversial issues is a popular strategy with teachers. However, Roger Bybee questions this approach. He contends that when teaching about evolution teachers should educate students about the nature of science and develop their science inquiry abilities, rather than debating the issue.

In this paper I support this view, based on the argument that the creationism and evolution dispute is not really about Biology or faith, but is about Biblical interpretation. A summary of the major differences between Theistic Evolution and Creationism is described. Teaching about Charles Darwin in the historical context of the 19th century is suggested as one way to assist students to develop an understanding of science as being socially constructed.

Henri Bergson argued that the process of natural selection could not adequately explain the evolution of complex organs such as the vertebrate eye. He believed that there is another channelling force at work called the 'vital impulse'. In Bergson's Creative Evolution he argues for lived time – the uniqueness of time in the lived experience – which is duration, not the mechanistic clock time. Accordingly, I challenge the view of science currently being taught in schools. The dilemma is that while a mechanistic view of science continues to dominate Western thinking, the science taught in classrooms will be inadequate.

Introduction

Thinking back, I now realise that for 13 years, as a young Biology teacher in secondary schools in Victoria and overseas in Malaysia, I taught the process of evolution as if it was the accepted view. In those days, in my classes creationism was not discussed. To my recollection, there was only one occasion where a student handed in an assignment that focused on ideas from Creationism[1] As it happened that Year 12 student failed the assignment - not because she opposed the process of evolution - but because she heavily plagiarised work from a well-known article. Since then my views on the nature of science have changed. I now use constructivist teaching strategies to elicit and engage students' prior ideas and beliefs, and realise how resistant these are to change.

What is the current situation in Australia?

You only have to read the newspapers to be aware that the evolution and creation science[2] controversy is in the public arena. Earlier this year I read Garry Linnell's well-constructed story, "God's classroom" (The Age Good Weekend, 24/2/2001).

[1] Opponents to the biologists are the Creationists or fundamentalist Christians. They believe the Book of Genesis in the Bible is the only source of information about the origin of life, including humans. Creationists view the fossil evidence for evolution as unacceptable, believing that species cannot change (Webster, 2000).

[2] The term "creation science" is used by creationists interchangeably with the term creationism, presumably to give it more credibility.

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Linnell was horrified at the extent to which creationism was being taught in science classrooms in Australia. Linnell questions whether creationism has a place in the science classroom at all. He claims that in many Christian schools creationism is being taught alongside the theory of evolution - not in the subject area of religious education - but in science. A literature search revealed that the situation is even more pronounced in the USA.

The debate is alive and well in the United States of America

Ian Pilmer (2001) argues strongly that Creation Science is not about science or religion but is political, and stems from a Protestant Christian Fundamentalist group in the USA.[3] Staver experienced the effects of the evolution-creation controversy while on the committee responsible for writing the science standards. "A year into the developmental process, Kansas State Board of Education (KSBE) members and the writing committee remain engaged in a dialogue about a single issue, the presence or absence of evolution theory in the state science standards" Staver (2001). This disagreement arises because half the KSBE members have an understanding of the nature of science that is consistent with their fundamentalist religious views. These members believe in a literal reading of Scripture and therefore oppose the inclusion of evolution theory in the school curriculum.

The quandary for science educators is whether to include evolution and/or creation science in school curricula. Brent Dalrymple (2000), Professor in the College of Oceanic and Atmospheric Sciences, Oregon State University, questioned whether the scientific version of the history of the Earth and Universe or the creationist's view should be taught in public schools. He argues that science education evidence and conclusions of real science, not pseudoscience, should be taught. He asserts that creationism is not science and therefore should not be included in the science curriculum.

The continuing controversy between Creationism and Evolution

Before discussing further this far-reaching sociocultural controversy, it is helpful to clarify the meaning of the term creationism. *Creationism* refers to the viewpoint that the literal Biblical account of creation is the correct explanation for the origin of the Earth and its living forms, and that evolutionary theories are false. Fulljames (1996) argues that Creationism must be carefully distinguished from the belief in God as creator because many Christians claim that belief in God as creator is consistent with an evolutionary theory of origins.

The basic elements of Creationism are:

- The age of Creation – the earth is approx 6,000 – 12,000 years old.
- The Time of Creation - six days with the seventh the Sabbath day God rested.
- The mode of Creation – with God's 'special' creative acts.

According to Murray and Buffaloe (1983, p. 464) "the vast mainstream of Theistic interpretation has long ago assimilated the concept of evolution into its faith-perspective, along with modern astronomy, the atomic theory, and other scientific findings." Creationism disputes the age of the Earth, claiming that it is very young, only 6,000 to 12,000 years old. Young-Earth Creationists contend that their beliefs about the origin and history of the natural world - that they call "scientific creationism" - are just as scientific as those of real science.

[3] Modern creationism had its origins in the speculations of Christian Science founder Mary Baker Eddy and her disciple George McCready Price (Berry, 1999).

Figure 1 A summary of the major differences between Theistic Evolution and Creationism (Murray & Buffaloe, 1983, p. 468).

Issue	Theistic Evolution	Creationism
1. Existence of God	God is the sole creator of the universe – purposefully brought it into existence.	1. (Same)
2. The Place of Man	2. Man bears the "image of God" – Is called into special relationship with his creator.	2. (Same)
3. Age of the World	3. 4.5 - 4.7 billion years.	3. Not more than 10,000 years.
4. Mode of Creation	4. God initiated the principles of nature and allowed them to take a gradual, unfolding course, which is continuing.	4. God directly created all things in seven days or periods, following the sequence in Genesis I.
5. Origin of Man	5. Man's biological nature emerged from more primitive origins, until he became capable of bearing a spiritual nature.	5. Man was instantaneously created by God's direct act, physically and spiritually.
6. Biblical Interpretation	6. Genesis accounts of creation are pre-scientific literature of parable and saga, not in competition with modern science.	6. Genesis accounts are to be interpreted as literal, scientific descriptions.

Dalrymple considers "scientific creationism an oxymoron, as it is religion pure and simple, a fact clearly recognised by federal court rulings in both Arkansas and Louisiana ... that struck down as unconstitutional the 'equal time for creationism' laws of those states" (2000, p. 45). He contends that the Creationists have no valid data or calculations to support their claims, but rely on their interpretation of the six-day creation and global flood 4000 years ago. In contrast, there is a vast amount of scientific evidence, such as radiometric dating of rocks and star dates, that tell us the Earth and Solar System are approximately 4.54 billion years old.

Biblical Interpretation

Murray and Buffaloe (1983) see the major thrust of Creationists is a questioning of the validity of evidence (supplied by various areas in science) for evolution. This questioning comes from a theological bias that is based on a literal interpretation of the Genesis account of creation.

Antony Campbell (1997) from the Jesuit Theological College in Melbourne argues against claims that creationism takes the Bible literally on the grounds that there are numerous portrayals of creation in the Bible with the most familiar being in Genesis 1 and 2.

Scripture the big three images of the creator God are:

- *the mighty fighter* (Psalm 74 (vv 13-14, 16-17) and 89 (vv 9-12), Job 7:12, 9:13-14, 26:6-11, 12-14; 38-41), Isaiah 51:9-11);
- *the co-operative artist* (God of Genesis 2 – 2:7, 19); and
- *the majestic proclaimer* (Genesis 1 – 1:3, 1: 11, 24-25).

Creationists would not agree with the picture of creation by combat with the God of Israel and the forces of chaos. Campbell considers literalism to be a red herring in creation issues. "Creationism is not supported by the biblical text. The biblical text itself is the best evidence for that" (Campbell, 1997, p. 31). The central issue then is about Biblical interpretation, making the two viewpoints irreconcilable. The Institute for the Study of Christianity in an Age of Science and Technology (Vic) holds the following view on scientific accounts of origins:

> The principal reason that biological evolution, together with theories of cosmic origins of the universe and geological origins of the earth, are held to be incompatible with Scripture is defective hermeneutical method in the approach to Scripture. Meanings are read into the literary form of Scripture, which are beyond the apparent intent of the passages concerned. (ISCAST, discussion paper, http://www.iscast.org.au/papers)

The 'days' in Genesis 1 can be interpreted as 24-hour periods. However, exegetically days could be representations of long periods of time. "God resting" on day seven could indicate rhythm in God's pattern for Creation.

How does the nature of science differ from creationism?
It is generally accepted that science is socially constructed. Ben Selinger, emeritus professor of chemistry at ANU, contends that " science offers us a reliable, testable and repeatable process for making decisions, using the best available information as a basis" (2001, p.115). Repeatable evidence, gained through observation, measurement, experimentation, calculation and deduction, is what underpins science. Such evidence is transparent to an international scientific community and is out there available for all to evaluate. When new evidence is discovered, explanations change and these may disprove the scientific theory, giving rise to a new theory. In this way a scientific theory is the best explanation at a given time that accounts for the evidence available On the other hand 'Creation science' requires an untestable supernatural being, and hence is not science. "Creationism first starts with an untestable conclusion and then trawls for evidence" (Pilmer, 2001, p. 36).

Approaches to teaching evolution
Science educators take a variety of approaches to addressing the classroom implications of the conflict between creationism and evolution. "Some take on a crusading spirit and try to expurgate all mention of religious notions from the science classroom in the name of the higher principle of naturalistic explanation" (Jackson et al., 1995, p. 588). Others encourage teachers to use the controversial issue by explicitly raising and then critically examining 'creation science' arguments in class to provide an interesting counter example to a scientific theory.

A third group push for allowing alternative views to emerge in less structured peer discussions. This context arouses less anxiety about the theory of evolution as an example of scientific knowledge.

Teaching the nature of science rather than debating the controversial issue
Teaching about science will require the teaching of theories such as biological evolution. However, Roger Bybee believes that evolution is not taught well in schools. He suggests that science teachers should not debate creationists. Instead they should assist students to better understand and appreciate science as a way of explaining the natural world. He recommends the teaching of the relationships between the scientific processes and the structure and development of a theory like evolution. Teachers could encourage students to reflect on the nature of current scientific knowledge, and how the scientists come to know what they do about nature. This view flies in the face of many science textbooks that describe science as a body of knowledge rather than 'one way of knowing'. Bybee also argues that often science is taught as a systematic method or as a process involving skills such as observing, hypothesising and inferring. Both perspectives leave students uncertain about the human endeavour called science. It would be more helpful to teach about the nature of science and incorporate inquiry in school science curricula.

In agreement with this view, within the context of Northern Ireland, is the research by Francis and Greer who identified the conditions that allowed students to develop positive attitudes towards both Science and Christianity.

> These conditions include an understanding of the nature of science, which questions the claim of scientism[4] and an understanding of the Christian faith, which questions the literal authority of the genesis creation narratives. Both positions being highly consistent with the accepted trends

[4] Scientism is the view that scientific theories can attain absolute truth and that only science is of value in explaining phenomena.

within the philosophy of science and within the critical traditions of Christian theology should be presented as intellectually viable options within the curriculum of science education and religious education. (Francis & Greer, 2001, p. 50)

Why teach about Darwin as the reluctant revolutionary?

For 20 years Charles Darwin kept his controversial idea about the natural order, collecting a vast amount of evidence before going public with his idea. He did this because he knew that his views relating to human evolution could be damaging to the understanding of the nature of human kind. Teaching about Darwin in the historical context of the 19th century means that students will better understand that science is a human endeavour, which is socially constructed. As a young man Darwin sailed the world; a naturalist on a small Royal Navy ship HMS *Beagle*. He collected insects, wrote natural history books, fathered ten children, and was an invalid for 40 of his 73 years. Darwin's view of evolution by the process of natural selection can be engaging for students when stories are told about Darwin's life. For example "as a boy, he once found two beetles under some bark and grabbed one in each hand. Then he spied a third. Not wanting to miss it, he put the beetle in his right hand into his mouth and picked up the newcomer. The beetle in his mouth then stung the collector, forcing him to spit it out" (Thwaites, 2001).

Teachers could choose to combine stories of his life with the story of the conflict Darwin's ideas stirred up at the 'Oxford Meeting' of the British Association in 1860. Bishop Samual Wilberforce and T. H. Huxley represented the differing sides of the conflict.

"The bishop made a bad start for the creationist camp by using more rhetoric than reason (Richardson, 1999, p. 18). Hal Hellman's (1998) account in his chapter 'Darwin's Bulldog versus Soapy Sam' is a lively description of the evolution war going on at that time. Wilberforce opposed evolution because it legitimised the notion of change in the Divine order. Darwin's reaction to his attackers was anguish, and his deeply religious wife became distressed when the religious establishment went against her husband. Although Darwin made no mention of a Creator in the first edition of the *Origin of Species* in the second edition soon after, he made the change to "having been initially breathed by the Creator into a few forms or into one" (Hellman, 1998). Many religious people can accept the ideas of evolution and natural selection, but also keep the belief that God is there, most probably at the beginning. God created the universe out of chaos. Although R. A. Fisher initiated the neo-Darwinian synthesis in the 1920s through his work on the effects of gene substitution and the evolution of dominance, it was not generally accepted until the late 1940s.

Bergson's Creative Evolution

Evolution, the emergence of higher species including human beings, was said to be the by-product of physical processes in nature over geologic millennia. However, "this explanation was not adequate for Henri Bergson because it did not provide a satisfactory explanation of evolution itself, and did not account for human consciousness and the lived experience. Some other force - not merely mechanical - must have been at work" (Boorstin, 1998, p. 246). In his book *Creative Evolution* (1911; French edition, L'Evolution Creatrice, 1907) Bergson outlined his own vitalist view. Bergson received the Nobel Prize for literature in 1928. Bergson argued that the process of natural selection operating on random variations could not explain the evolution of a complex organ like the eye of vertebrates. There must be another channelling force at work, that he called 'vital impulse'. Bergson's idea of lived time – the uniqueness of time in the lived experience - was duration, not the mechanistic clock time. He used the metaphor of the cinema – a succession of changed images seen in rapid succession – to explain both the making of 'the mechanistic illusion' and the need for the idea of duration. For Bergson life could only be known by bathing in the full stream of experience. "Consciousness corresponds exactly to the living being's power of choice; it is coextensive with the fringe of possible action that surrounds the real action; consciousness is synonymous with invention and with freedom" (Bergson, cited in Boorstin, p. 250).

In the *Liberation of Life* ecology and evolution are considered to belong together, and evolution is described as a continuous process. "The actual process of evolution cannot be understood apart from the purposive behaviour of the animals that are evolving" (Birch & Cobb, Jr, 1981, p. 64).

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Conclusion

In this paper I have argued against debating the controversial issue of evolution versus creationism in science classrooms on the grounds that the two views are irreconcilable. Rather, teachers should educate students about the nature of science and develop their science inquiry abilities. The dilemma is that while a mechanistic view of science continues to dominate Western thinking, the science taught in schools will be inadequate.

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